

AMINO ACID COMPOSITION OF INGREDIENTS: CROP YEAR 2010

INTRODUCTION:

The swine and poultry industries in North America utilize a significant amount of corn, soybean meal [SBM] and corn dried distiller's grains, with solubles [DDGS] in their feed formulations. While some nutritionists assume that the protein quality [*i.e.* amino acid (AA)] of these feedstuffs has not changed over the years, the reality is that genetic selection, planting time, weather, and processing conditions after harvest will all have an impact upon the content, digestibility and availability of AAs. To hedge against losing money and ensure that the animals' nutritional requirements are met, nutritionists often track and update the AA matrix values in their least-cost formulation software. This crop survey report is designed to assist nutritionists with these efforts.

SURVEY GUIDELINES:

Ajinomoto Heartland, Inc. [AHI] coordinated with several of its customers on submitting new crop samples from the 2010 growing season for amino acid analysis [samples were received from October 2010 until February 2011]. In submitting the samples, we asked the participants to provide the state and/or city that each sample was harvested [corn] or manufactured [DDGS and SBM].

The summary tables below provides a general contrast between the analyzed AA means within a given sample and that of either the [Poultry NRC \(1994\)](#) [PNRC], [Swine NRC \(1998\)](#) [SNRC], and/or data from Dr. Hans Stein's lab [[HSL](#)] ([HHS Swine Focus-001-2007](#)). The summaries for each ingredient are a "snap shot" of a larger dataset that AHI or your AHI agent can provide to you in an Excel format. The Excel file contains a pivot table that allows you to query the protein and amino acid profile of each feedstuff by country, state and region. This is something that AHI and/or your AHI agent can go over with you at your convenience.

Please contact your AHI agent or me if you have any questions about the survey.

Sincerely,



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The corn samples in the following table are divided into three categories: Midwest-USA, East-SE-USA and ALL-USA. While the overall CP average of corn [*i.e.* ALL-USA] settled out around 7.45% [n=93], the CP of corn in the East-SE [n=43] and Midwest [n=50] was ~8.11% and 6.88%, respectively. This difference could indicate that a different population of corn was grown in each of the regions [*i.e.* #2 yellow dent corn in the Midwest vs. some other corn in the East-SE – perhaps NutriDense®]. Regardless of the region, corn analyzed lower in CP [*on an as-is and DM basis*] when compared to the PNRC and SNRC datasets. Looking at only the Midwest data, tLys, tThr, tM+C, tArg, tIle, tVal, tSer and tTrp analyzed lower when compared to the East-SE and both NRC datasets. For the East-SE data, many of the previously mentioned AAs were in agreement with the NRC datasets; however, the tThr, tMet, tM+C, tArg, tGly and tSer were [*at most*] 19, 35, 21, 14 and 18% higher when compared to the NRC references and Midwest data. **Key takeaways: AA values for corn may vary by region.**

INGREDIENT	REGION	STATISTIC	DM	CP	CP (DMB)	tLYS	tTHR	tMET	tM+C	tARG	tILE	tVAL	tGLY	tSER	tTRP	
Corn	Midwest - USA	Mean	87.56	6.88	7.85	0.23	0.26	0.18	0.34	0.36	0.24	0.34	0.28	0.34	0.05	
		Stdev	1.31	0.59	0.64	0.01	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.03	0.01	
		Observations	50	50	50	50	50	50	50	50	50	50	50	50	50	50
		AA: CP Ratio	-	-	-	3.39	3.82	2.64	4.98	5.24	3.51	4.99	4.08	4.94	0.78	
		AA: Lys Ratio	-	-	-	100	113	78	147	155	104	147	121	146	23	
Corn	East-SE - USA	Mean	88.88	8.11	9.12	0.26	0.31	0.23	0.41	0.41	0.28	0.40	0.31	0.40	0.06	
		Stdev	1.08	0.72	0.78	0.02	0.03	0.02	0.04	0.05	0.03	0.03	0.02	0.04	0.01	
		Observations	43	43	43	43	43	43	43	43	43	43	43	43	43	43
		AA: CP Ratio	-	-	-	3.21	3.77	2.78	5.11	5.06	3.51	4.89	3.82	4.94	0.80	
		AA: Lys Ratio	-	-	-	100	117	87	159	158	110	152	119	154	25	
Corn	ALL - USA	Mean	88.17	7.45	8.44	0.25	0.28	0.20	0.38	0.38	0.26	0.37	0.29	0.37	0.06	
		Stdev	1.37	0.89	0.95	0.02	0.03	0.03	0.05	0.05	0.03	0.04	0.02	0.04	0.01	
		Observations	93	93	93	93	93	93	93	93	93	93	93	93	93	93
		AA: CP Ratio	-	-	-	3.30	3.79	2.71	5.04	5.15	3.51	4.94	3.95	4.94	0.79	
		AA: Lys Ratio	-	-	-	100	115	82	153	156	107	150	120	150	24	
Corn	1994 Poultry NRC	Mean	88.00	8.50	9.66	0.26	0.29	0.18	0.36	0.38	0.29	0.40	0.33	0.37	0.06	
		AA: CP Ratio	-	-	-	3.06	3.41	2.12	4.24	4.47	3.41	4.71	3.88	4.35	0.71	
		AA: Lys Ratio	-	-	-	100	112	69	138	146	112	154	127	142	23	
Corn	1998 Swine NRC	Mean	89.00	8.30	9.33	0.26	0.29	0.17	0.36	0.37	0.28	0.39	-	-	0.06	
		AA: CP Ratio	-	-	-	3.13	3.49	2.05	4.34	4.46	3.37	4.70	-	-	0.72	
		AA: Lys Ratio	-	-	-	100	112	65	138	142	108	150	-	-	23	

Two sources of DDGS are compared in the following table, Canadian and Midwest-USA. On an *as-is* basis, the DM of the two DDGS sources [88.63 and 86.35%, respectively] is much lower than that of the PNRC dataset [93%¹]. Comparing the tLys values, Canada and the USA are 23 and 12% higher in tLys than the PNRC [0.75% tLys]. In addition, the relative ratio of tLys: CP [an indicator of Lys quality / availability] is ~3.33%; a value that far exceeds that of the PNRC [2.76%] and that which is recommended by the HSL [≥ 2.80 – see [HHS Swine Focus-001-2007](#)^{2, 3}]. Judging from the lower DM of the 2010 samples and that of the PNRC and HSL datasets, it is likely that Lys was not damaged as the DDGS was dried. The Canadian DDGS has a higher concentration of all AAs [except tGly] when compared to the DDGS from the Midwest, and are more in agreement with that of the HSL than the PNRC. **Key takeaways: AA quality of DDGS has improved, but also may vary by region.**

INGREDIENT	REGION	STATISTIC	DM	CP	CP (DMB)	tLYS	tTHR	tMET	tM+C	tARG	tILE	tVAL	tGLY	tSER	tTRP	
DDGS	Canada	Mean	88.63	27.74	31.30	0.92	1.04	0.52	1.05	1.24	1.03	1.50	0.89	1.31	0.24	
		Stdev	0.51	0.67	0.86	0.04	0.04	0.02	0.04	0.07	0.04	0.05	0.08	0.05	0.01	
		Observations	9	9	9	9	9	9	9	9	9	9	9	9	9	9
		AA: CP Ratio	-	-	-	3.30	3.76	1.87	3.80	4.48	3.70	5.41	3.22	4.71	0.85	
		AA: Lys Ratio	-	-	-	100	114	57	115	136	112	164	98	143	26	
DDGS	Midwest - USA	Mean	86.35	25.12	29.08	0.84	0.96	0.49	0.96	1.18	0.94	1.30	1.00	1.21	0.23	
		Stdev	1.69	1.06	0.88	0.05	0.04	0.03	0.06	0.11	0.05	0.06	0.06	0.06	0.02	
		Observations	29	29	29	29	29	29	29	29	29	29	29	29	29	29
		AA: CP Ratio	-	-	-	3.34	3.82	1.94	3.84	4.70	3.74	5.16	4.00	4.80	0.91	
		AA: Lys Ratio	-	-	-	100	114	58	115	141	112	155	120	144	27	
DDGS	ALL - USA & CANADA	Mean	86.89	25.74	29.61	0.86	0.98	0.49	0.99	1.19	0.96	1.34	0.98	1.23	0.23	
		Stdev	1.78	1.49	1.29	0.06	0.05	0.03	0.07	0.10	0.06	0.11	0.08	0.07	0.02	
		Observations	38	38	38	38	38	38	38	38	38	38	38	38	38	38
		AA: CP Ratio	-	-	-	3.33	3.81	1.92	3.83	4.64	3.73	5.22	3.80	4.78	0.90	
		AA: Lys Ratio	-	-	-	100	114	58	115	139	112	157	114	143	27	
DDGS	1994 Poultry NRC	Mean	93.00	27.20	29.25	0.75	0.92	0.60	1.00	0.98	1.00	1.30	0.57	1.61	0.19	
		AA: CP Ratio	-	-	-	2.76	3.38	2.21	3.68	3.60	3.68	4.78	2.10	5.92	0.70	
		AA: Lys Ratio	-	-	-	100	123	80	133	131	133	173	76	215	25	
DDGS	Stein (2007); HHS-SwineFocus-001-2007	Mean	93.00	27.50	29.57	0.78	1.06	0.55	1.08	1.16	1.01	1.35	1.02	1.18	0.21	
		AA: CP Ratio	-	-	-	2.84	3.85	2.00	3.93	4.22	3.67	4.91	3.71	4.29	0.76	
		AA: Lys Ratio	-	-	-	100	136	71	138	149	129	173	131	151	27	

¹ Dr. Stein’s data was assessed a 93% DM.

² The analytical values that are reported are influenced by the source of corn and both the fermentation and processing conditions of the ethanol plant. The values are segregated by state, not ethanol plant.

³ DDGS data from Dr. Stein’s lab is referenced in the table above. For those that have access to the Excel worksheet entitled “2010 Crop Survey Report_4-4-2011”, the 1998 Swine NRC can be selected from a dropdown menu for an alternate comparison.

The SBM¹ sample analyses in the following table are divided into three categories: Midwest-USA, East-SE-USA and ALL-USA. Samples from the East-SE analyzed higher in CP than either of the Midwest or NRC datasets. The average CP of SBM from the East-SE was 48.34% [n=27], Midwest was 46.97% [n=50] and of all samples was 47.45% [n=77]. The average CP [n=77] was in agreement with that of the two NRC datasets. Following the lower CP, the tLys, tMet, tM+C, tArg, tGly, tSer and tTrp of the Midwest samples analyzed lower than that of the East-SE, PNRC and SNRC datasets. Comparing analysis data for the East-SE samples to that of the PNRC and SNRC datasets; tLys, tM+C and tTrp analyzed low, while tArg and tVal analyzed high. **Key takeaways: Enough differences exist in the AA quality of SBM for nutritionists to track and periodically update the AA matrix values for SBM in their formulation software.**

INGREDIENT	REGION	STATISTIC	DM	CP	CP (DMB)	tLYS	tTHR	tMET	tM+C	tARG	tILE	tVAL	tGLY	tSER	tTRP	
SBM	Midwest - USA	Mean	89.27	46.97	52.62	2.92	1.86	0.64	1.29	3.41	2.17	2.30	1.97	2.36	0.62	
		Stdev	0.67	1.27	1.39	0.08	0.05	0.04	0.08	0.25	0.06	0.09	0.08	0.06	0.06	0.06
		Observations	50	50	50	50	50	50	50	50	50	50	50	50	50	50
		AA: CP Ratio	-	-	-	6.21	3.95	1.35	2.76	7.26	4.61	4.89	4.19	5.02	1.33	
		AA: Lys Ratio	-	-	-	100	64	22	44	117	74	79	67	81	21	
SBM	East-SE - USA	Mean	89.52	48.34	54.01	2.93	1.88	0.67	1.36	3.52	2.17	2.33	1.99	2.37	0.64	
		Stdev	0.48	0.59	0.70	0.06	0.04	0.02	0.03	0.24	0.05	0.08	0.17	0.06	0.07	
		Observations	27	27	27	27	27	27	27	27	27	27	27	27	27	27
		AA: CP Ratio	-	-	-	6.06	3.88	1.38	2.81	7.29	4.49	4.82	4.12	4.91	1.31	
		AA: Lys Ratio	-	-	-	100	64	23	46	120	74	80	68	81	22	
SBM	ALL - USA	Mean	89.36	47.45	53.10	2.92	1.86	0.65	1.32	3.45	2.17	2.31	1.98	2.36	0.63	
		Stdev	0.62	1.26	1.36	0.07	0.05	0.04	0.07	0.25	0.06	0.09	0.12	0.06	0.06	
		Observations	77	77	77	77	77	77	77	77	77	77	77	77	77	
		AA: CP Ratio	-	-	-	6.15	3.93	1.36	2.78	7.27	4.57	4.87	4.16	4.98	1.32	
		AA: Lys Ratio	-	-	-	100	64	22	45	118	74	79	68	81	22	
SBM	1994 Poultry NRC	Mean	88.40	47.50	53.73	2.96	1.87	0.67	1.39	3.48	2.12	2.22	2.05	2.48	0.74	
		AA: CP Ratio	-	-	-	6.23	3.94	1.41	2.93	7.33	4.46	4.67	4.32	5.22	1.56	
		AA: Lys Ratio	-	-	-	100	63	23	47	118	72	75	69	84	25	
SBM	1998 Swine NRC	Mean	90.00	47.50	52.78	3.02	1.85	0.67	1.41	3.48	2.16	2.27	-	-	0.65	
		AA: CP Ratio	-	-	-	6.36	3.89	1.41	2.97	7.33	4.55	4.78	-	-	1.37	
		AA: Lys Ratio	-	-	-	100	61	22	47	115	72	75	-	-	22	

¹ Dehulled and solvent-extracted. While the values are segregated by region [based on state], the analytical values that are reported are influenced by the source of soybeans that are either trucked or railed to a crushing plant. The values are segregated by state, not crushing plant.